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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/212,726	12/15/1998	KLAUS F. SCHUEGRAF	M122-1098	7984

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EXAMINER	
BLUM, DAVID S	
ART UNIT	**PAPER NUMBER**
2813	

DATE MAILED: 05/10/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/212,726	SCHUEGRAF, KLAUS F.	
	Examiner	Art Unit	
	David S. Blum	2813	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *30 April 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *60-62,64 and 66* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *60-62,64 and 66* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

This action is in response to the RCE and amendment filed 04/30/06.

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

2. Claim 60 (and dependent claims 61-62, 64, and 66) are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Claim 60 limits the invention to providing O2 into the reactor without passing through an ozone generator. The instant specification as originally presented contained no teachings regarding an ozone generator.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the

invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims **60**-62, 64 and 66 are rejected under 35 U.S.C. 103(a) as being unpatentable over US 5,356,722 (**Nguyen** et al.) in view of US 5,593,741 (**Ikeda**) and considered with **Wolf**, et al. Silicon Processing for the VLSI Era, Vol. 1-Process Technology, Lattice Press: Sunset Beach CA, 1986, pp. 166-167, for a showing of inherency only.

Regarding claim 60, **Nguyen** discloses a semiconductor processing method of depositing a SiO_2 layer comprising,

providing a substrate **12** within a cold-wall, chemical vapor deposition (CVD) reactor **10** (Fig. 2);

providing rf power of 300 to 1000 watts, which overlaps 650 watts and a temperature of 350 to 450 °C within the CVD chamber, which overlaps 400 °C, (col. 4, table in lines 33-46);

injecting liquid TEOS into the CVD reactor at a flow rate of 400-1000 sccm, which overlaps 975 sccm (col. 4, table in lines 33-59)(TEOS is a liquid at room temperature, and is in the gas form when injected into the deposition chamber. As best understood by the examiner, the TEOS of the instant claims is also gasified prior to injection, as it is injected at 975 sccm, a gas measurement);

Regarding the limitation of 975 sccm, Nguyen forms a nitride containing SiO2 at 400-1000 sccm and a non-nitrogen containing SiO2 at 1000 sccm. The gas flow rate is an example, and not limiting. One skilled in the art would know that the gas flow is

dependent upon the chamber size. Therefore the difference between 975 sccm and 1000 sccm is one of mere optimization.

These ranges are considered to involve routine optimization while it has been held to be within the level of ordinary skill in the art. As noted in In re Aller (105 USPQ233), the selection of reaction parameters such as temperature and concentration would have been obvious:

> "Normally, it is to be expected that a change in temperature, or in concentration, or in both, would be an unpatentable modification. Under some circumstances, however, changes such as these may impart patentability to a process if the particular ranges claimed produce a new and unexpected result which is different in kind and not merely degree from the results of the prior art. Such ranges are termed "critical ranges and the applicant has the burden of proving such criticality.... More particularly, where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation."
> In re Aller 105 USPQ233, 255 (CCPA 1955). See also In re Waite 77 USPQ 586 (CCPA 1948); In re Scherl 70 USPQ 204 (CCPA 1946); In re Irmscher 66 USPQ 314 (CCPA 1945); In re Norman 66 USPQ 308 (CCPA 1945); In re Swenson 56 USPQ 372 (CCPA 1942); In re Sola 25 USPQ 433 (CCPA 1935); In re Dreyfus 24 USPQ 52 (CCPA 1934).

One skilled in the requisite art at the time of the invention would have used any ranges or exact figures suitable to the method in the process of deposition regarding rate flows using prior knowledge, experimentation, and observation with the apparatus used in order to optimize the process and produce the SiO2 layer desired to the parameters desired.

Regarding the limitation of providing O2 into the reactor at 600 sccm without passing through an ozone generator, Nguyen teaches flowing 1000-6000 sccm of ozone into the

reactor (column 4 line 57). As 13 % of the oxygen is ozone (column 4 line 58), Nguyen then teaches 6692 sccm of oxygen that has not passed through an ozone generator. Regarding the limitation of providing He into the reactor at 775 sccm, Nguyen teaches providing He and TEOS at 1000-5000 sccm (column 4 line 40). The examiner states that the volume of gas does not determine the finished product, as the volume of gas would vary with the size of the chamber. It is noted that the instant specification teaches 600 sccm of O2 and 775 sccm of He, almost a 1:1 ratio. The specification also teaches a gas flow of 975 sccm of TEOS, an approximate ratio of 2:3 (O2:TEOS) and a 2:5 ratio (O2:He,TEOS). The gas flows as taught by Nguyen (column 4 lines 56-57) also teach a O2:He,TEOS ratio of 2:5 and allow for O2:He ratios in the 1:1 to 6:8 ratio and an O2:TEOS ratio of 2:3. any variance within the taught gas flows is one of optimization as recited above.

And, decomposing the TEOS to form SiO_2 and depositing the SiO_2 onto the substrate, the decomposing being conducted at a pressure of from about 5 to 15 Torr, which overlaps 10-80 Torr (col. 4, table in lines 33-46).

It is seen to be inherent that the reactor of **Nguyen** is a cold-wall reactor, because the heating of the wafers is via the lamp heater **38** located beneath the wafer **15** (Fig. 2; col. 3, lines 58-66). **Wolf** at pages 166-167 indicates that when the heating comes from within the reaction chamber, that the reactor is called a "cold-wall" reactor, as compared to a "hot-wall" reactor wherein the heating elements are located external to the chamber.

Nguyen does not feed gaseous H_2O_2 into the CVD reactor.

Ikeda also teaches a plasma CVD method of depositing SiO_2 on a semiconductor substrate in a cold-wall CVD reactor using TEOS, oxygen and H_2O_2. **Ikeda** states that the H_2O_2,

> "The obtained film is comparable in film properties to silicon oxide films deposited by known plasma CVD methods and, when the substrate has steps such as aluminum wiring lines, is **better in step coverage and gap filling capability**. The film exhibits a still better profile when hydrogen peroxide gas or an alternative hydrogen containing gas is added to the reactant gas mixture." (Abstract)

Regarding claim 61, **Ikeda** discloses that the gaseous precursors of H_2O_2 **234** and TEOS are independently fed into the CVD reactor (Fig. 11; col. 11, lines 60-62).

Regarding claim 62, **Ikeda** discloses that the precursors of H_2O_2 and TEOS are fed into the CVD reactor simultaneously (Fig. 11; col. 11, lines 60-62).

Regarding claim 64, **Ikeda** inherent feeds gaseous H_2O into the CVD reactor at least because the maximum concentration available is 98% H_2O_2 and because H_2O_2 decomposes into H_2O and O as shown to be inherent in **Ikeda** in the paragraph bridging cols. 11-12.

Regarding claim 66, **Nguyen** (col. 2, lines 16-21) and **Ikeda** (Abstract) each implicitly teach that the substrate has a high aspect ratio and that the SiO_2 is conformally deposited, because the method "provides improved conformality and void-free gap filling" (Nguyen, col. 2, lines 16-21) and is "better in step coverage and gap filling capability" (Ikeda, Abstract). "[I]n considering the disclosure of a reference, it is proper to take into account not only specific teachings of the reference but also the inferences which one skilled in the art would reasonably be expected to draw

therefrom." *In re Preda*, 401 F.2d 825, 826, 159 USPQ 342, 344 (CCPA 1968) See also *In re Lamberti*, 545 F.2d 747, 750, 192 USPQ 278, 280 (CCPA 1976).

As applied to all of the claims above, it would have been obvious for one of ordinary skill in the art, at the time of the invention to add H_2O_2 to the gas mixture of **Nguyen** in order to gain better profile in step coverage and gap fill over high aspect ratio gaps, as taught by **Ikeda**.

Response to Arguments

5. Applicant's arguments filed 9/14/05 have been fully considered but they are not persuasive.

The applicant argues that the claims are allowable because each and every limitation is not taught by the cited art.
The applicant recites each limitation of claim 60, thus the examiner is unclear as to what limitation is not taught by the cited art.

The applicant argues that the power cited by the examiner is toward the deposition of a nitride layer. The examiner notes that the frequency of the oxide deposition is the same (13.56 MHz) as the nitride layer deposition and the temperature range is identical (350-450 degrees C.) for both processes, suggesting the power is also the same. Nguyen (column 4 line 67 teaches that the rf power for oxide deposition may be 13.56 MHz.

The applicant also argues that the gas flows for the oxide deposition in Nguyen are 1000-5000sccm for He and TEOS (together) and this does not teach or suggest a gas flow of 975 sccm for TEOS and 775 sccm for He. However, together, the instant application is claiming a gas flow of 1750 sccm (for He and TEOS together). This is within the teachings of Nguyen. Nguyen does not teach the ratio of gas flow between He and TEOS, but as the ratio in the instant specification is nearly 1:1 (9.75:7.75) and helium is considered a carrier gas or inert gas, one could achieve the gas flow claimed by the instant claim by routine optimization of the gas flows taught by Nguyen. Without evidence to the contrary, the process of Nguyen would result in the same layer as the instant specification and the gas flows suggested by Nguyen may be identical.

The applicant further argues that the flow rate of 1000-6000 sccm O2 from ozone do not meet the flow rate of the instant specification of 600 sccm of oxygen not passed through an ozone generator. The examiner admits the gas flow is higher in Nguyen (as are all upper ends of the gas flow ranges. However the volume of gas reflects on the size of the chamber and not on the chemistry of the deposited layer. The ratios of gasses reflect on the resultant chemistry. Nguyen teaches gas flow ratios as in the claims. Further, the specification offers no support for the negative limitation of "without passing through an ozone generator".

The applicant argues that the pressure reported is directed toward the nitride layer deposition. However, other parameters for the nitride deposition and the oxide deposition are identical, suggesting the pressure is held within the same parameters. Also, it is noted that the gas flow for all nitrogen gasses may be at 0 sccm, leaving the process to deposit an oxide layer.

The applicant argues that the secondary reference, Ikeda, uses H2O2 in conjunction with ozone-oxygen gas (Nguyen also uses ozone-oxygen gas), but the instant claims require O2 without passing through an ozone generator. The claims as written do not preclude the use of an ozone generator, or ozone, but rather an amount of gas that is not ozone or did not pass through an ozone generator. Ikeda has this. Further, the specification offers no support for the negative limitation of "without passing through an ozone generator".

The applicant argues that Wolf (used to show the use of a cold wall reactor) does not teach or suggest or contribute to the recited combination of providing H2O2 and O2 without passing through an ozone generator. Wolf was not used for this limitation and the examiner asserts that Nguyen and Ikeda teach and suggest this. Further, the specification offers no support for the negative limitation of "without passing through an ozone generator".

The applicant argues that dependent claims 61-62, 64, and 66 are allowable as they are dependent upon claim 60. However, claim 60 is not allowable.

Conclusion

6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to David S. Blum whose telephone number is (571)-272-1687) and e-mail address is David.blum@USPTO.gov .

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead Jr., can be reached at (571)-272-1702. Our facsimile number all patent correspondence to be entered into an application is (571) 273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

David S. Blum
May 9, 2006